

# City of Antigo Wastewater Plant Boiler Upgrade

## EXISTING HEATING SYSTEM

The existing system consists of a BRYAN 1,700,000 BTU input Natural Gas Hot Water Boiler, (2) B & G Series 80 system pumps, a Boiler feed water tank with pump and a expansion tank. The boiler system appears to have been originally set up for the use of glycol (antifreeze) for the heating media. The existing boiler is a single stage boiler with no modulation or turndown.

The Heating appliances consist of (2) 100% outdoor air make up air units, 2-cabinet heaters, and 9-unit heaters. The original installation of the heating system consisted of a rooftop hot water heating / cooling multizone Air Handler system that has been removed and replaced with packaged gas heating / cooling units. 1- of the make up air units is (MAU-2) is not in use and the heating water coil has been valved off.

The existing heating system is operating with just water and the water has a low PH and high Total Dissolved Solids. TDS.

The Air Handlers or Make Up Air Units are using a face and bypass heating coil that allows heating water to flow through the coils any time the boiler and pumps are turned on. The unit heaters also have water flow anytime the heating system is turned on. The boiler and pumps are manually turned on at the beginning of the heating season and manually turned off at the end of the heating season.

The system main heating pumps are leaking and are in poor condition. The rated flow rates for the pumps are 100 GPM @ 40 feet of head for each pump. This parallel pump assembly was designed for only one pump needing to operate at a time and to have a standby pump that would normally be rotated on a weekly basis. There is no automatic control of the system.

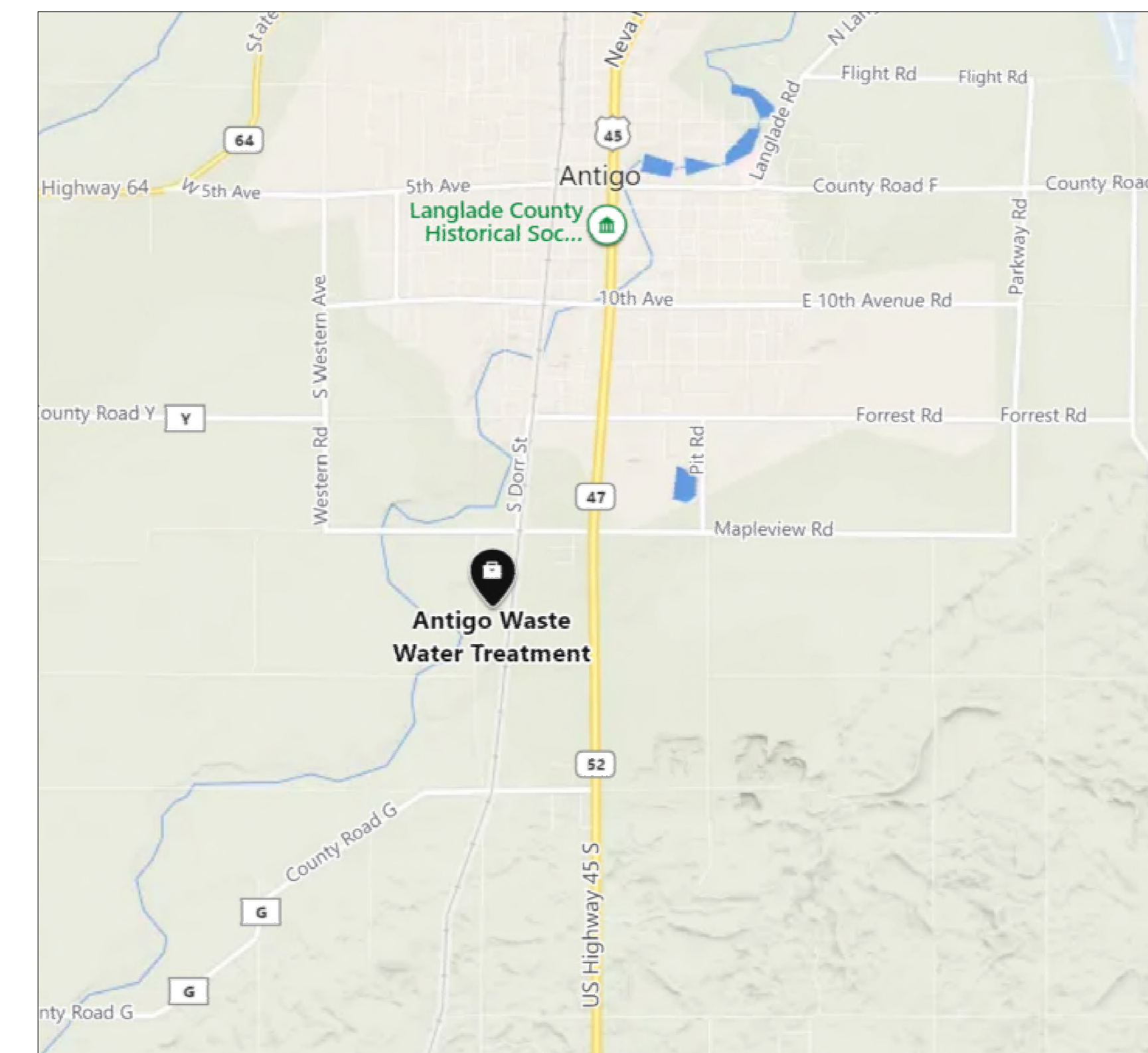
The existing system is operating with a connected load of 598,800 BTU of heating coils.

## SCOPE OF WORK

Remove and dispose existing Boiler, Pumps, Expansion Tank, Feed Water Tank, Feed water Pump and associated piping. Install new High Efficiency Modulating Condensing Boiler, pumps, boiler feed water tank, new bladder style expansion tank, automatic pump lead lag controller, automatic pump and boiler enable control based on outdoor air temperature, Emergency Stop Switch, Piping as shown on this plan. Flush entire system before connecting to the new boiler and pumps. Flush system once new pumps and boiler are installed. Fill system with filtered water having a PH, Chloride, conductivity and TDS within the boiler manufacturers spec and with a 30% Glycol mixture for best protection only. Program the boiler control for outdoor reset control, use a scale of 140-degree heating water at 70 degrees outdoor air temperature and 180 degrees heating water temperature at 15 degrees outdoor air temperature. The outdoor air sensor must be located on the North side of the building and away from any heat sources. Install per this plan and follow all manufacturers installation instructions. Provide and Install a Emergency Stop Station to shut down the boiler, the station switch must be just outside the boiler room door. Remove the existing 14" boiler venting and chase the new 6" boiler vent through the existing vent on the roof. Properly flash and seal new vent to the existing vent. The new boiler vent must extend a minimum of 36" above the top existing rooftop units to allow the flue gas to discharge above the economizer air intake. Guy wire the vent per manufacturers installation instructions. A minimum of 3 guy wires must be installed. Provide and install permanent anchors in the roof for guy wire installation. Anchor installation must be done to not disrupt the integrity of the roof membrane and must be done per manufacturers installation instructions.

## SEQUENCE OF OPERATION

When the outdoor air temperature drops below 70 degrees (adjustable) the outdoor air temperature remote setpoint thermostat will energize relay R-3. The relay R-3 will enable the Heat-Timer pump controller and will enable the Boiler and the Lead Pump. The Lead primary heating pump will start and make the system flow switch. If the flow switch fails to make after 30 seconds of starting the Lead Pump, the standby pump will be started and an alarm condition will be enabled. A pump failure will create an alarm on the lead lag pump panel. The Lead Lag pump control will change the lead pump every 7 days. The Boiler will be controlled by the internal boiler controller.



INSULATION REQUIREMENTS IMC-604.1 thru 604.13 / IECC-C403.2.9		
All Supply and return air ducts and plenums shall be insulated with a minimum of R-6 insulation when located in unconditioned spaces and a minimum of R-12 insulation when located outside the building. When located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-12 insulation.		
<b>DUCT INSULATION</b> Must have R-value, installed thickness, flame spread & smoke development index every < 36"		
<b>Supply, Return Ducts and Plenums to be Insulated.</b> Minimum R-6.0 required (Commercial) in Unconditioned Spaces. Minimum R-12.0 required when duct located outside Building Envelope.  Not required with temperature difference < 15 degrees F.		
PIPING INSULATION MINIMUM INSULATION REQUIREMENT WALL THICKNESS IECC (2009) Table 503.2.8 SPS361 to 366		
FLUID	NOMINAL PIPE DIAMETER	
	≤ 1.5"	> 1.5"
Steam	1-1/2"	3"
Hot Water	1-1/2"	2"
Chilled Water, Brine or Refrigeration	1-1/2"	1-1/2"

HVAC Test and Balance IMC / SPS 364.0313(1)	
Every heating, ventilating and air conditioning system shall be balanced upon installation. The person or agency responsible for balancing of the ventilation system shall document in writing the amount of outdoor air being provided and distributed for the building occupants, exhausts, and any other specialty ventilation. The document shall be retained at the site and shall be made available to the department upon request.	

Gas Piping SPS 365.0400	
All Gas piping installations shall comply with NFPA 54-2009, National Fuel Gas Code.	

Operating Manuals IMC / SPS 364.0313(3)	
All operating manuals concerning the HVAC equipment and its maintenance shall be presented to the owner and shall be made available to a Department representative upon request.	

SHEET INDEX  
HV-5 Details and Controls

SHEET INDEX  
HV-1 Scope and Information  
HV-2 Building Plan Views  
HV-3 Boiler Room Layout  
HV-4 New Boiler Piping

PROJECT:  
**CITY OF ANTIGO WASTEWATER**  
N2420 Koszarek Road  
Antigo, Wisconsin 54409

DESIGNER:  
STANLEY A. GRYS JR.  
LOCATION:

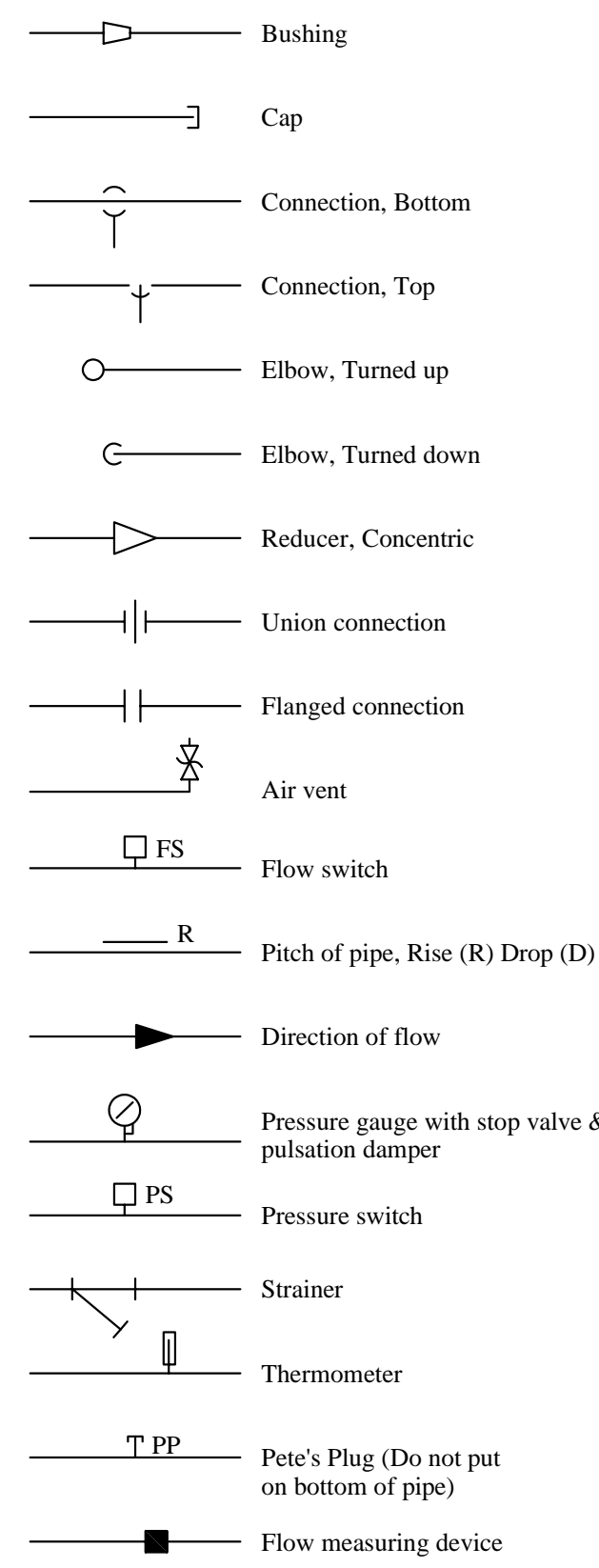
Refrigeration  
Control  
Ltd.  
Design, Inc.  
751 Washington Street  
PO Box 1052  
Rhinelander, Wisconsin 54501  
715-365-2009

Scope and Notes

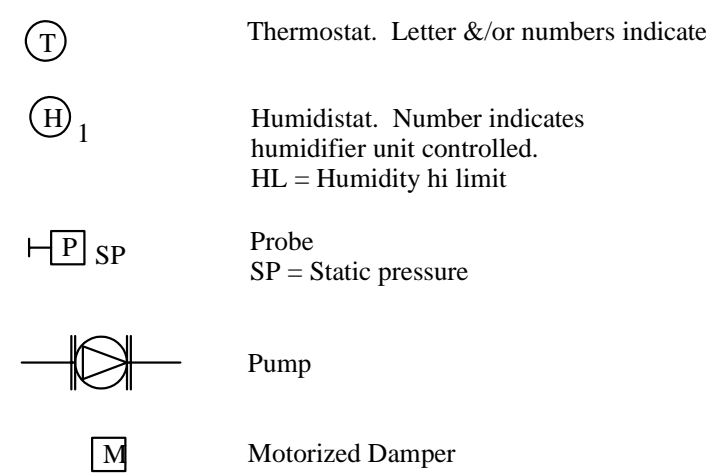
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HV-1



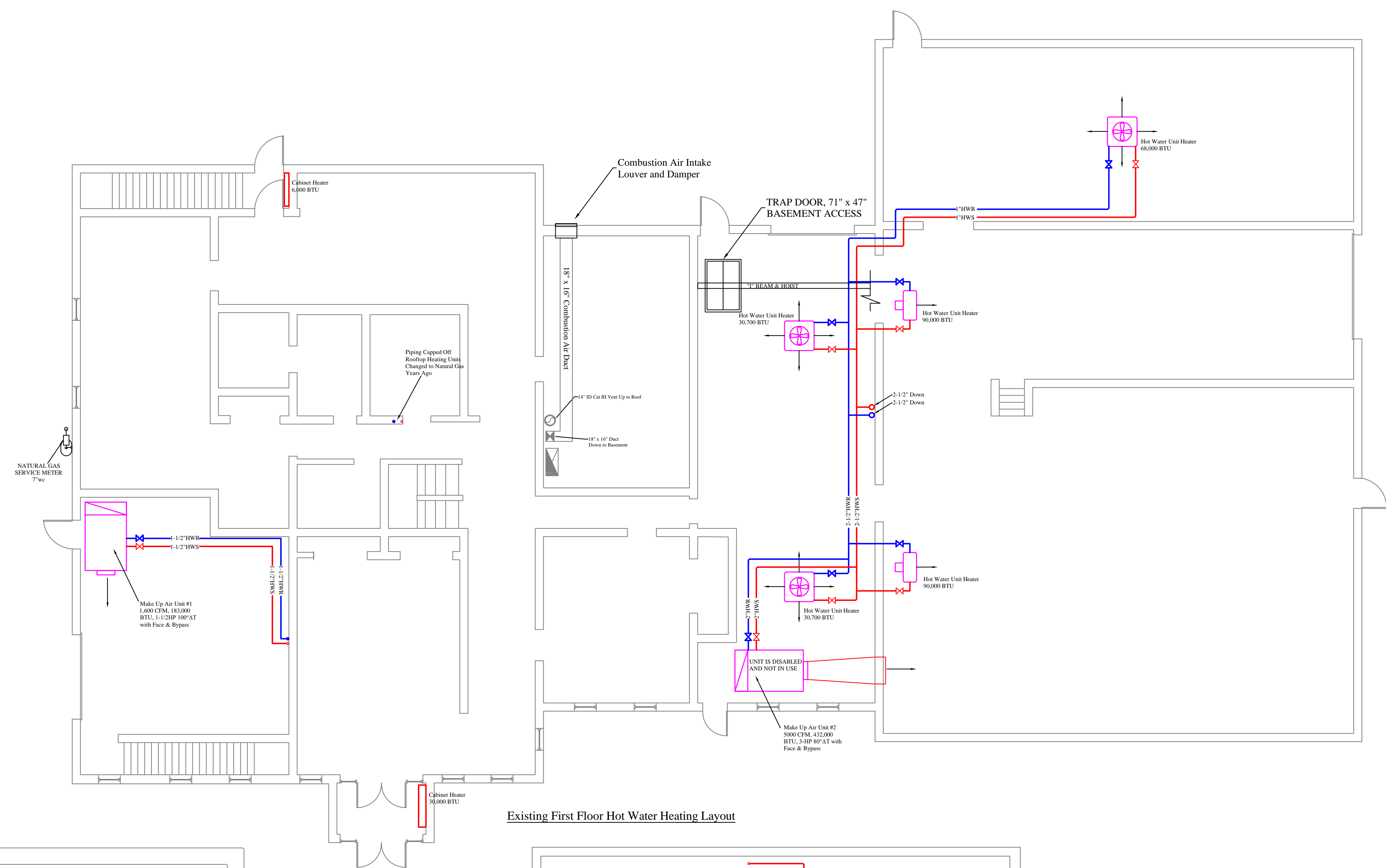
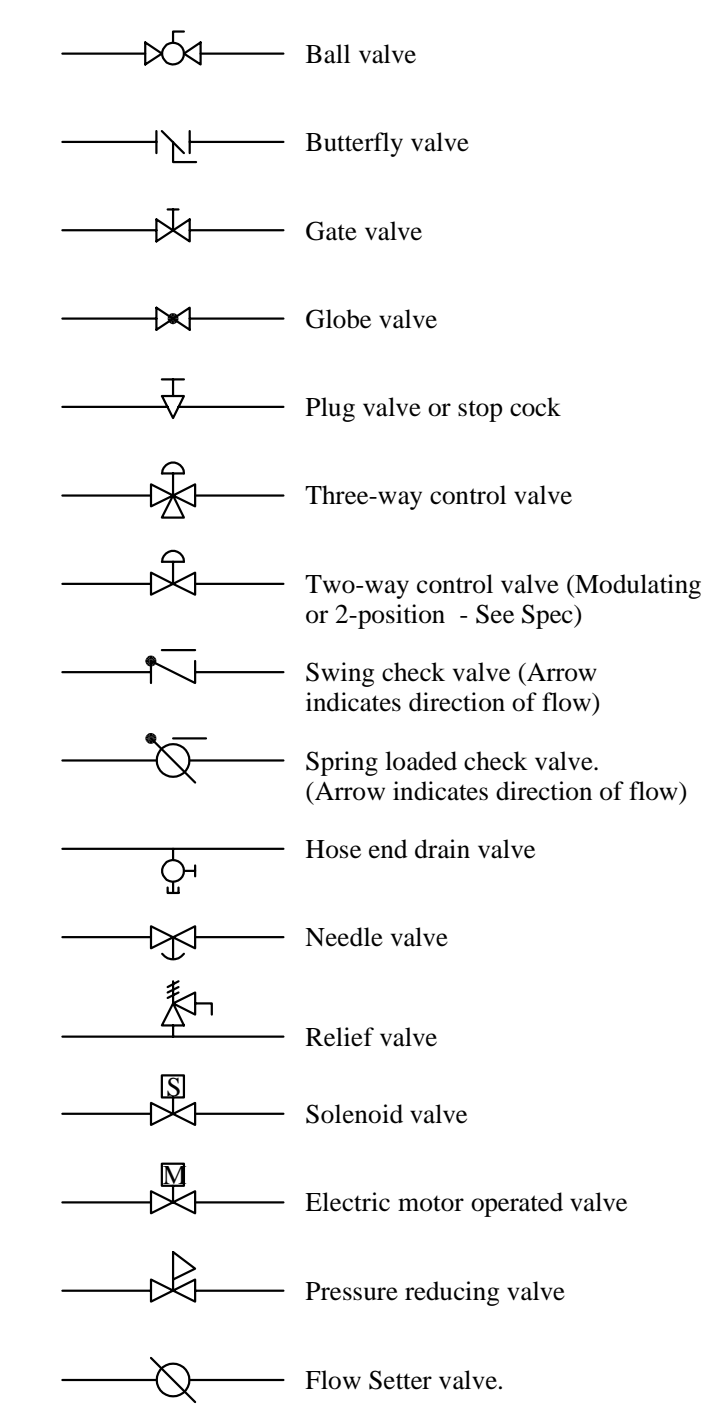
PIPING SYMBOLS



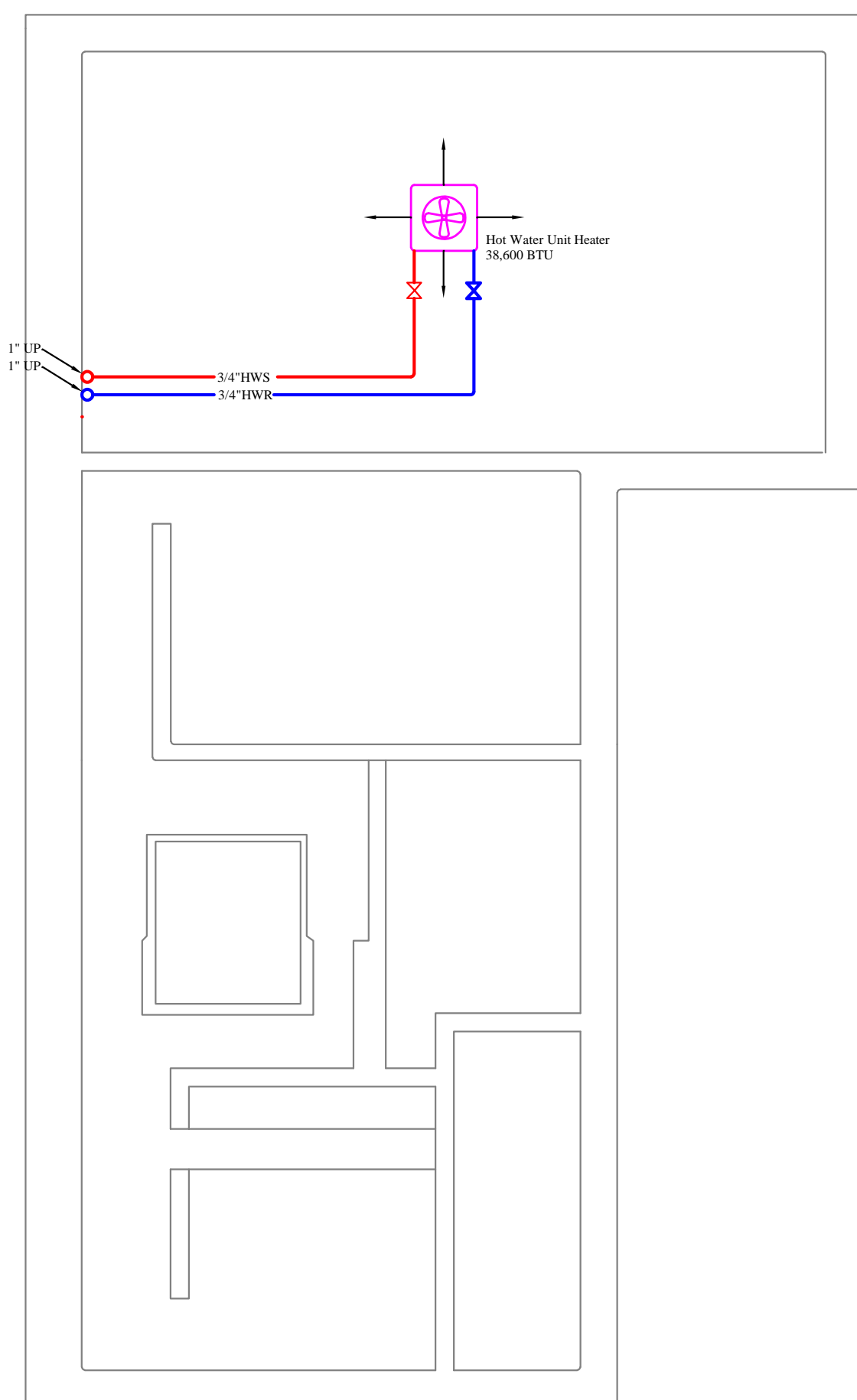
MISCELLANEOUS SYMBOLS



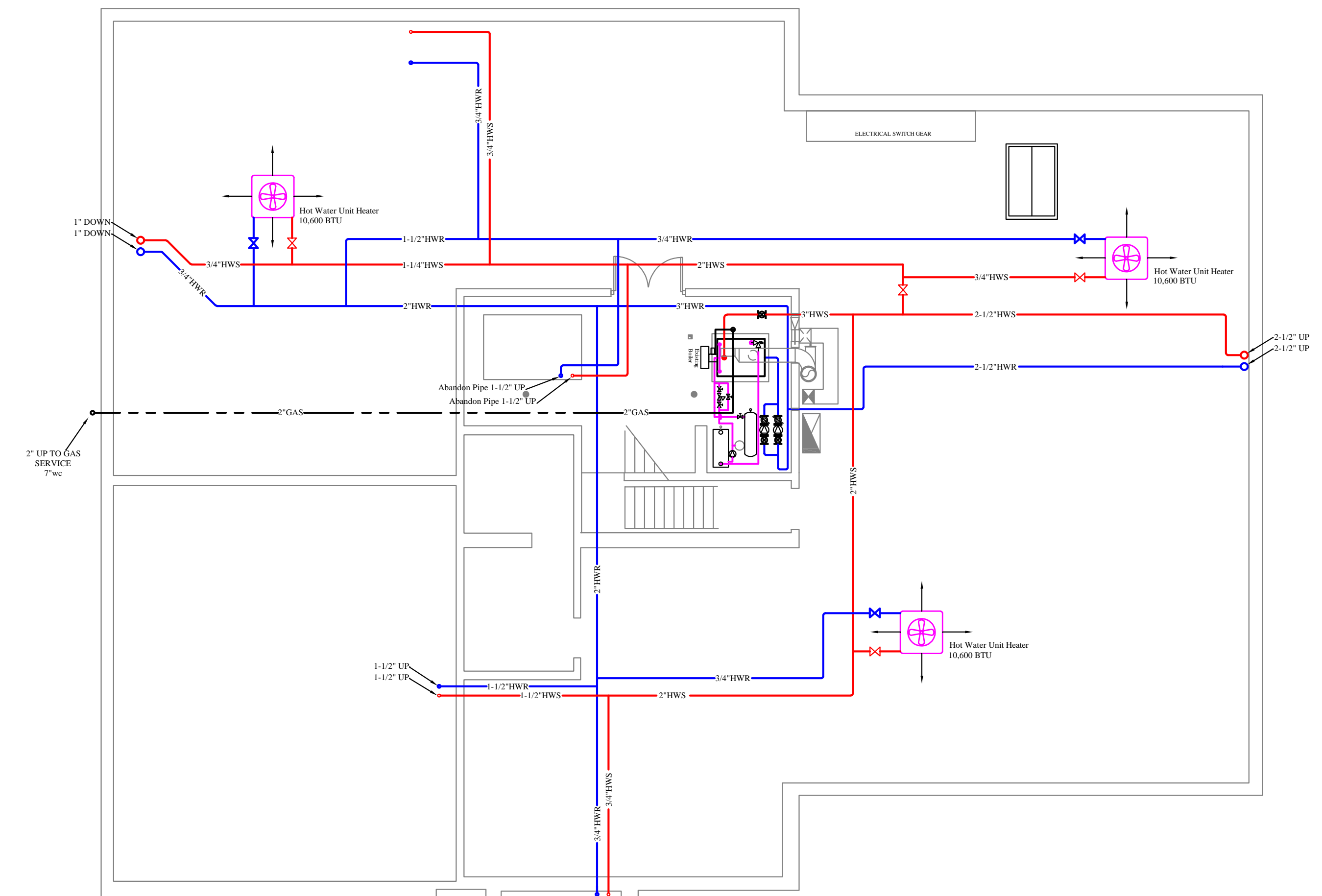
VALVE SYMBOLS



Existing First Floor Hot Water Heating Layout



Existing Sub-Basement Hot Water Heating Layout



Existing Basement Hot Water Heating Layout

SHEET INDEX

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**CITY OF ANTIGO WASTEWATER**  
N2420 Koszarek Road  
Antigo, Wisconsin 54409

DESIGNER:  
STANLEY A. GRYS JR.

LOCATION:

Refrigeration  
Control  
Ltd.  
Design, Inc.

751 Washington Street  
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715-365-2009

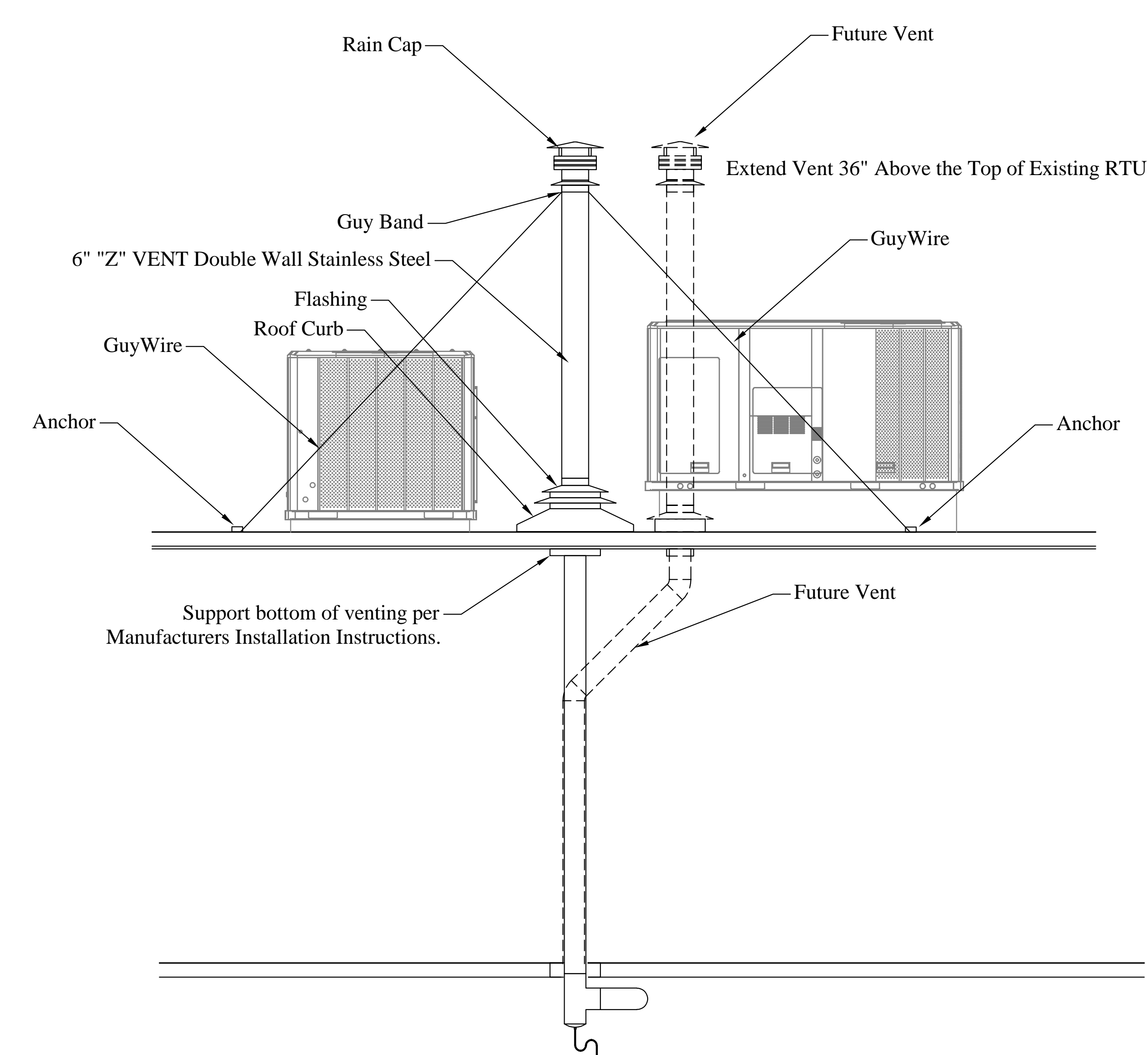
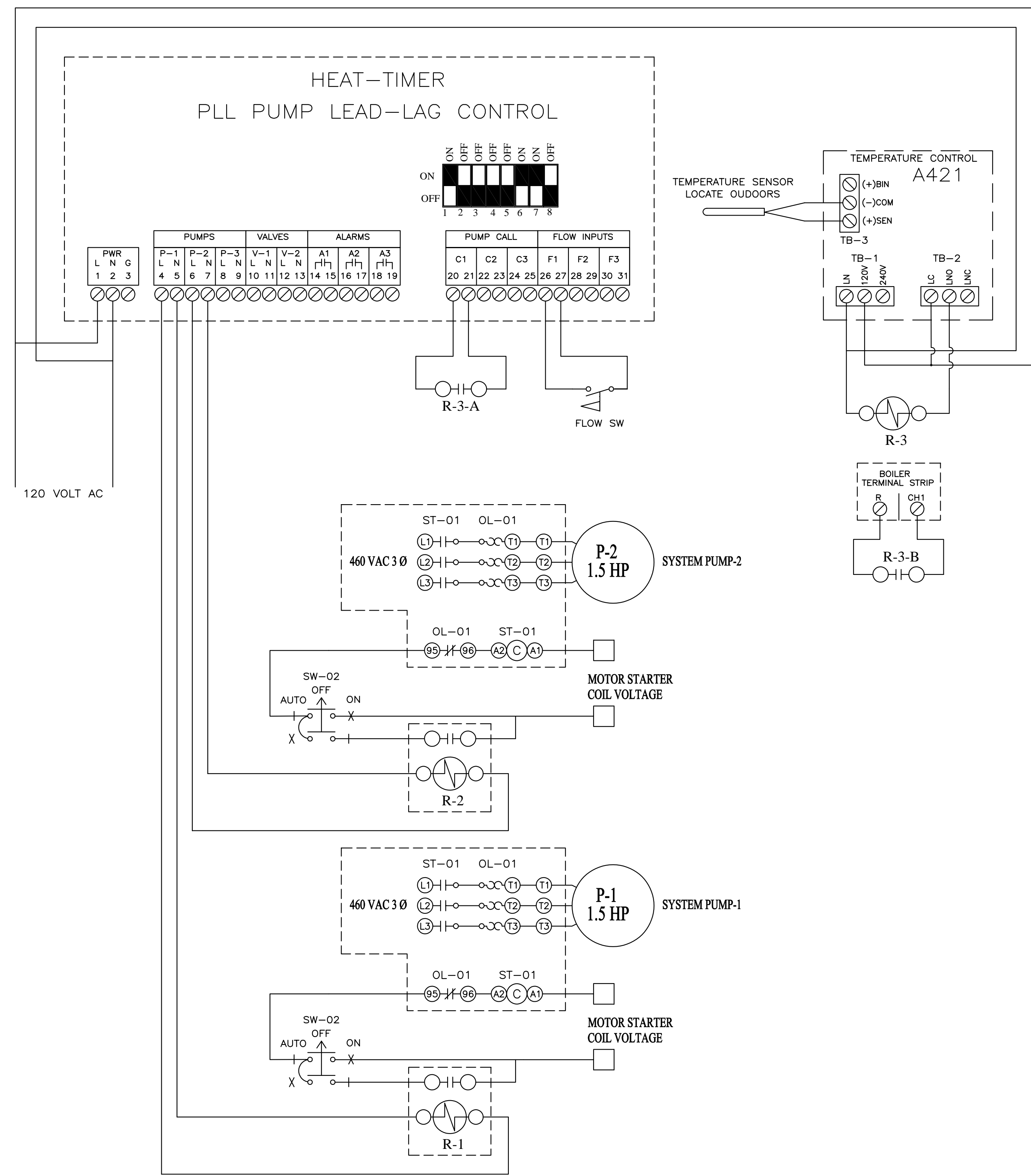
Existing System

Date	5-3-2022	Sheet	HV-2
Scale	1/4" = 1'		









**TYPICAL VENTING DETAIL**

**1-Call / 1-Flow (2-Pump Mode) or (3-Pump Mode)**

- This mode is designed to rotate two system pumps in a hydronic application.
- The PLL rotates the pumps based on either timed rotation or alternating demand (per call). The rotation options are selected via dip switches.
- The pump call must be connected to Pump 1 input terminals (C1) (20 and 21). In addition, the flow input must be connected to Flow 1 input terminals (F1) (26 and 27).
- Alternating demand activates a different pump each time a pump call is initiated.
- Timed rotation has two options, 1 day, and 7 days rotation.
- When rotation of the lead pump is to take place during a timed rotation, the operation of both pumps, old lead pump and new lead pump, will overlap for a few seconds to eliminate a no-flow period prevent boiler short-cycling.
- In these modes, if a pump fails to provide proof-of-flow for period of 30 seconds, the PLL will turn it off. Also, it will turn on its alarm and turn on the next lead pump.

**UPDATE BOILER CONTROLS**

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PROJECT:	<b>CITY OF ANTIGO WASTEWATER</b>
DESIGNER:	N2420 Koszarek Road Antigo, Wisconsin 54409
LOCATION:	STANLEY A GRYS JR
REFRIGERATION CONTROL DESIGN, INC.	751 Washington Street PO Box 1052 Rhinelander, Wisconsin 54501 715-365-2009
DETAILS & NEW CONTROLS	
REV 5-3-2022	<b>HV-5</b>
NOTED	